

Northeastern Forest Experiment Station

Upper Darby, Pennsylvania
Ralph W. Marquis, Director

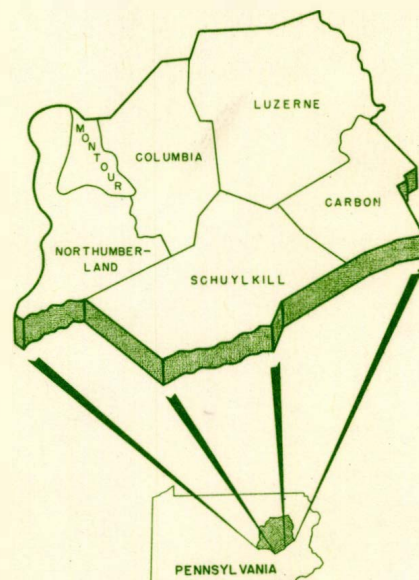
INTERMOUNTAIN STATION
Central Reference File
No. 0.73



Forest Statistics

for the

Anthracite Section of Pennsylvania



Forest Statistics Series
Pennsylvania No. 1

1955

FOREWORD

This is the first in a new series of reports about forest areas and timber volumes in Pennsylvania. It is a product of the Forest Survey of the Northeast, carried on by the Northeastern Forest Experiment Station as part of the nationwide survey being made by the Forest Service, U. S. Department of Agriculture.

The Pennsylvania State Planning Board provided the aerial photographs used in the survey. The Pennsylvania Department of Forests and Waters provided office space and gave other valuable assistance.

Field work in the Anthracite Section of Pennsylvania was supervised by N. B. Griswold. The statistical procedures used were developed by C. Allen Bickford. Computations were made under the supervision of Roland H. Ferguson.

Ralph W. Marquis

RALPH W. MARQUIS
Director

CONTENTS

	Page
GENERAL	1
Forest area	2
Ownership	2
Forest types	2
Forest stands	2
Timber volume	3
Pulpwood volume	3
 TABLES	
Land area	4
Commercial forest-land area . . .	4
Timber volume	7
Average volume per acre	10
 APPENDIX	
Definitions of terms	11
Forest survey methods	14
Accuracy of the estimates	14
Species tallied	15

Forest Statistics for the Anthracite Section of Pennsylvania

Prepared By The

DIVISION OF FOREST ECONOMICS

*Northeastern Forest Experiment Station
Forest Service, U.S. Dept. Agriculture*

GENERAL

THE ANTHRACITE SECTION of Pennsylvania is situated in the east-central part of the State. It is bounded on the east by the Pocono Mountains and on the west by the Susquehanna River, the east branch of which divides the area. It extends north from the Blue Mountains to the Allegheny Plateau. The area includes Carbon, Columbia, Luzerne, Montour, Northumberland, and Schuylkill Counties.

Roughly two-thirds of the area lies south of the broad Susquehanna River valley. The topography here is characterized by a series of parallel ridges. North of the river the terrain gradually rises to the high rolling land of the Allegheny Plateau.

This section of Pennsylvania is best known for its deposits of anthracite. Coal mining, the largest industry, is most common south of the Susquehanna River. A variety of other industries, most of them small, are located in the larger towns. Agricultural activities are of more importance in Columbia, Montour, and Northumberland Counties. The

principal types are general farming, dairying, and poultry raising.

Forest Area

The total land area of the Anthracite Section amounts to about 2 million acres. Nearly 58 percent--1,164,000 acres--are forested. A little less than 20,000 acres of forest land are reserved from commercial timber cutting. This is the forest area in State Parks. Little or no forest land is incapable of producing a commercial timber crop. The remaining 1,144,000 acres are classed as commercial forest land.

Three counties--Carbon, Luzerne, and Schuylkill--are more than half forested. Their combined commercial forestland acreage represents more than three-fourths of the total.

Ownership

About 88 percent of the commercial forest land is privately owned. Of this, a fifth is owned by farmers and four-fifths by private nonfarm owners. The remaining 12 percent is in public ownership. More than half of this is held by the State, almost all in State Game Lands. Municipal holdings are usually owned by a water authority for watershed purposes. County holdings are negligible.

Forest Types

Three-fourths of the commercial forest land carries one of the oak types. The chestnut oak type, occurring on the higher and drier sites, occupies 31 percent of the forest land. The red oak type, most common on the middle and lower slopes, accounts for 28 percent. Much less extensive are the white oak type (9 percent) and oak-pine types (3 percent). The scrub oak type, found on old burn sites, covers 4 percent of the forest area.

About 15 percent of the forest land is in other hardwood types, predominantly the aspen-gray birch type and the sugar maple-beech-yellow birch type. The remaining 10 percent of the commercial forests is occupied by softwood types. Half of this is hemlock; most of the rest is in the hard pine types, and only a minor portion is in white pine.

Forest Stands

Sawtimber stands occur on only 9 percent of the commercial forest land. Most of these stands are light sawtimber carrying from 1,500 to 5,000 board feet per acre.

Medium and heavy sawtimber stands (5,000 and more board feet per acre) are very scarce. Less than 1 percent of the forest area bears this kind of volume.

The bulk of the commercial forests is in stands of small size and volume: poletimber stands (42 percent); seedling-and-sapling stands and other areas (49 percent). Thus half of the forest land contains little or no growing stock and will not produce a commercial timber crop for many years.

Timber Volume

The growing stock on the commercial forests amounts to 450 million cubic feet. Of this, 154 million are in sawtimber trees and 296 million are in poletimber trees.

Included in this growing stock are nearly 598 million board feet (log scale, International $\frac{1}{4}$ -inch rule) of sawtimber. The oak species alone make up 46 percent of the total board-foot volume. Softwood species account for 36 percent of the total volume but only a fourth of the softwood volume is found in the softwood types.

Pulpwood Volume

According to pulpwood specifications developed by the Northeastern and Appalachian Technical Committees of the American Pulpwood Association, practically all of the growing stock is suitable for use by the pulp industry--including some large sawlogs and veneer-log material. In terms of these specifications, there are 5.4 million rough standard cords of pulpwood bolts.

Hardwood species account for four-fifths of the total pulpwood volume and, of this, about 70 percent is in the "hard" hardwoods--principally oak. Red maple and aspen are the abundant "soft" hardwoods. The pulpwood volume in the softwood species is predominantly white pine and hemlock.

Pulpwood stands averaging better than 5 cords per acre cover 35 percent of the commercial forest land. Of this, about one-fifth carries more than 15 cords per acre. The remaining 65 percent of the forest is more lightly stocked.

ANTHRACITE SECTION OF PENNSYLVANIA

Table 1.--Land area by major classes, 1952

Class of land ¹	Area	
	<u>Acres</u>	<u>Percent</u>
Forest land:		
Commercial	1,143,900	57
Noncommercial ²	19,800	1
All forest land	1,163,700	58
Nonforest land	850,400	42
All land ³	2,014,100	100

¹See Appendix for definitions.

²The acreage of productive forest land in State Parks that has been reserved from commercial timber cutting.

³From Areas of the United States 1950. Bureau of the Census.

Table 2.--Land area and commercial forest-
land area by county, 1952

County	Land area	Commercial forest-land area	
		<u>Acres</u>	<u>Percent</u>
Carbon	259,200	182,600	70
Columbia	309,800	139,800	45
Luzerne	570,200	387,200	68
Montour	83,200	28,800	35
Northumberland	290,600	93,400	32
Schuylkill	501,100	312,100	62
All	2,014,100	1,143,900	57

ANTHRACITE SECTION OF PENNSYLVANIA

Table 3.--Commercial forest-land area
by ownership, 1952

Ownership class	Acreage held	
	<u>Acres</u>	<u>Percent</u>
Private:		
Farm forest land ¹	202,400	18
Other private	805,300	70
Total private	1,007,700	88
Public:		
State ²	79,000	7
County	1,200	(3/)
Municipal	56,000	5
Total public	136,200	12
All ownerships	1,143,900	100

¹Census of Agriculture, 1950

²Includes 78,000 acres of State Game Lands.

³Less than 1 percent.

Table 4.--Commercial forest-land area
by forest type, 1952

Forest type	Area	
	<u>Acres</u>	<u>Percent</u>
Chestnut oak	347,800	31
Red oak	319,500	28
White oak	105,500	9
Scrub oak	47,600	4
Oak-pine types	33,000	3
Aspen-gray birch	99,100	9
Sugar maple-beech-yellow birch	43,200	4
Other hardwood types	28,000	2
Hemlock	53,100	5
Hard pine types	51,400	4
White pine types	15,700	1
All types	1,143,900	100

ANTHRACITE SECTION OF PENNSYLVANIA

Table 5.--Commercial forest-land area by forest-type group
and stand-size class, 1952

Forest-type group	Saw- timber stands	Pole- timber stands	Seedling-and- sapling stands and other areas	Total area
	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
Chestnut oak	10,600	157,100	180,100	347,800
Red oak	29,400	132,300	157,800	319,500
Other hardwood types	29,800	123,300	203,300	356,400
Softwood types	28,400	70,900	20,900	120,200
All types	98,200	483,600	562,100	1,143,900
Percent	9	42	49	100

Table 6.--Commercial forest-land area by stand-size class
and drainage area, 1952

Stand-size class	Drainage area		Total
	Delaware River	Susquehanna River	
	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
Sawtimber stands	26,600	71,600	98,200
Poletimber stands	120,100	363,500	483,600
Seedling-and-sapling stands	219,600	246,700	466,300
Other areas	54,500	41,300	95,800
Total	420,800	723,100	1,143,900
Percent	37	63	100

ANTHRACITE SECTION OF PENNSYLVANIA

Table 7.--Net volume of live timber on commercial
forest land by species, 1952

Species	Growing stock ¹	Saw- timber ²	Suitable for pulpwood ³
	Thousand cu.ft.	Thousand bd.ft.	Thousand cords
White pine	31,200	116,500	359
Hemlock	30,100	79,100	347
Hard pines and other softwoods	25,100	20,900	289
All softwoods	86,400	216,500	995
Red oaks	85,800	129,500	1,035
Chestnut oak	73,000	76,000	881
White oak	58,900	69,400	711
Red maple	48,100	26,100	580
Aspen	30,200	3,800	364
Sweet birch	18,100	15,000	214
Black cherry	9,100	20,200	110
Hickory	8,800	6,900	106
Sugar maple	6,500	2,000	78
Yellow-poplar	6,200	15,000	75
Yellow birch	5,600	5,000	72
White ash	4,900	4,300	59
Other soft hardwoods	3,400	2,900	41
Other hard hardwoods	5,400	5,100	65
All hardwoods	364,000	381,200	4,391
All species	450,400	597,700	5,386

¹See Appendix for definitions. Growing stock includes pulp-wood and sawtimber.

²Log scale, International $\frac{1}{4}$ -inch rule.

³4-foot bolts, including bark.

ANTHRACITE SECTION OF PENNSYLVANIA

Table 8.--Net volume of live timber on commercial
forest land by diameter class, 1952

Diameter class ¹ (in inches at breast height)	Growing stock	Saw- timber
	Thousand cu.ft.	Thousand bd.ft.
Softwoods:		
6	15,100	--
8	14,600	--
10	14,400	46,600
12	11,700	43,200
14	10,500	39,800
16	9,700	41,300
18	5,900	24,800
20 +	4,500	20,800
All softwoods	86,400	216,500
Hardwoods:		
6	96,100	--
8	99,800	--
10	70,200	--
12	29,800	101,700
14	26,800	106,900
16	17,400	70,600
18	11,900	48,400
20	5,900	26,400
22 +	6,100	27,200
All hardwoods	364,000	381,200
Total	450,400	597,700

¹The midpoint of each 2-inch diameter class is indicated.

ANTHRACITE SECTION OF PENNSYLVANIA

Table 9.--Net volume of live timber on commercial forest land
by forest type, 1952.

Forest type	Growing stock	Saw- timber	Suitable for pulpwood
	<u>Thousand cu.ft.</u>	<u>Thousand bd.ft.</u>	<u>Thousand cords</u>
Red oak	117,300	168,300	1,403
Chestnut oak	107,600	121,000	1,287
White oak	39,800	47,900	476
Sugar maple-beech-yellow birch	30,800	29,100	368
Other hardwood types	70,200	75,300	839
Hemlock	38,000	78,300	454
White pine types	23,400	62,400	280
Hard pine types	23,300	15,400	279
All types	450,400	597,700	5,386

ANTHRACITE SECTION OF PENNSYLVANIA

Table 10.--Average net volume of live timber per acre
of commercial forest land, by
stand-size class, 1952

Stand-size class (and acreage of each class)	Growing stock	Saw- timber
	<u>Cubic feet</u>	<u>Board feet</u>
Sawtimber stands:		
More than 5,000 bd.ft. per acre (10,500 acres)	2,200	7,500
1,500 to 5,000 bd.ft. per acre (87,700 acres)	1,300	3,100
Poletimber stands:		
More than 600 cu.ft. per acre (134,700 acres)	1,000	900
200 to 600 cu.ft. per acre (348,900 acres)	400	300
Other ¹ (562,100 acres)	80	60
Average, all classes ² (1,143,900 acres)	400	500

¹Includes seedling-and-sapling stands and non-stocked areas.

²Hardwoods constitute 81 percent of the total growing stock or 64 percent of the total sawtimber volume. The average cubic volume of the total commercial forest area is equivalent to 5 cords per acre.

Table 11.--Area and volume by pulpwood volume-per-acre class, 1952

Pulpwood class	Area	Volume
	<u>Thousand acres</u>	<u>Thousand cords</u>
Less than 5 cords per acre	743	1,099
5 to 15 cords per acre	325	2,819
More than 15 cords per acre	.76	1,468
Total	1,144	5,386

A P P E N D I X

DEFINITIONS OF TERMS

Forest Area

Forest-land area.--Includes (a) lands that are at least 10 percent stocked by trees of any size and capable of producing timber or other wood products, or of exerting influence on the climate or on the water regime; (b) land from which the trees described in (a) have been removed to less than 10 percent stocking and which has not been developed for other use; and (c) afforested areas. (Forest tracts of less than 1 acre, isolated strips of timber less than 120 feet wide, and abandoned fields and pastures not yet 10 percent stocked are excluded.)

Commercial forest-land area.--Forest land that is (a) producing, or physically capable of producing, usable crops of wood (usually sawtimber), (b) economically available now or prospectively, and (c) not withdrawn from timber utilization.

Noncommercial forest-land area.--Forest land (a) withdrawn from timber utilization through statute, ordinance, or administrative order but which otherwise qualifies as commercial forest land, and (b) incapable of yielding usable wood products (usually sawtimber) because of adverse site conditions.

Forest Types

Forest types are classified according to the species or species group that accounts for the major portion of the stand in terms of cubic feet in sawtimber and poletimber stands, or the number of stems in seedling-and-sapling stands.

Stand-Size Classes

Sawtimber stands.--Stands with sawtimber trees having a minimum net volume per acre of 1,500 board feet, International $\frac{1}{4}$ -inch rule.

Poletimber stands.--Stands failing to meet the sawtimber stand specification, but at least 10 percent stocked

with poletimber and larger (5.0 inches and larger) trees, and with at least half the minimum stocking in poletimber trees. (Poletimber stands carry at least 200 cubic feet per acre.)

Seedling-and-sapling stands.--Stands not qualifying as either sawtimber or poletimber stands, but having at least 10 percent stocking of trees of commercial species and with at least half the minimum stocking in seedling-and-sapling trees.

Other areas.--Forest-land areas not qualifying as sawtimber, poletimber, or seedling-and-sapling stands. (Includes nonstocked areas.)

Tree Classes

Sawtimber trees.--Trees of commercial species that contain at least one merchantable sawlog as defined by regional practice and that are of the following minimum diameters at breast height (d.b.h.): Softwoods 9.0 inches and hardwoods 11.0 inches. (All butt sawlogs are considered merchantable. Where the butt is defective, upper sawlogs are considered merchantable if they account--in terms of aggregate net volume--for 50 percent or more of the gross volume below the top of the uppermost sawlog. Softwood sawlogs are at least 6.0 inches in diameter inside bark at small end; 8 to 16 feet in length; sound and straight enough to be manufactured into standard lumber. The smaller logs are generally free of surface defects other than small tight knots. Hardwood sawlogs are at least 8.0 inches in diameter inside bark at small end; 8 to 16 feet in length; suitable for sawing into standard lumber, construction timbers, or ties.)

Poletimber trees.--Trees 5.0 inches d.b.h. and larger of commercial species that do not meet the specifications for sawtimber trees but do meet regional specifications of species, soundness, and freedom from defect. (These are the trees that are straight and clear enough to make sawtimber trees eventually.)

Seedling-and-sapling trees.--Trees of commercial species less than 5.0 inches in diameter at breast height.

Cull trees.--Live trees of sawtimber or poletimber size that are unmerchantable for sawlogs now or prospectively because of defect, rot, or species.

Timber Volume

Growing stock.--Net volume, in cubic feet, of live sawtimber trees and live poletimber trees from stump to a minimum 4.0-inch top (of central stem) inside bark.

Live sawtimber volume.--Net volume in board feet, International $\frac{1}{4}$ -inch rule, of live sawtimber trees.

Pulpwood.--Net volume in rough, standard cords (bark included) of growing stock, excluding sound defect as well as unsound defect.

Pulpwood Volume

The pulpwood specifications used in this report are those set up by the Northeastern and Appalachian Technical Committees of the American Pulpwood Association.

Pulpwood trees.--Live trees of commercial species, 5.0 inches d.b.h. and larger, containing at least two contiguous pulpwood bolts and with 50 percent or more of the main stem volume usable for pulp. (A merchantable pulpwood bolt is a section of the main stem of a pulpwood tree, 4 feet long; 4.0 inches or larger inside bark at the small end; free from any indication of rot, charred wood, metal or hollow center; and contiguous to one or more sections meeting these same requirements. Crotches are excluded; sweep or crook in any section shall exclude the bolt if a line from the center of the top cut to the center of the bottom cut passes outside the wood at any point. Most of the sawtimber and poletimber trees are also defined as pulpwood trees.)

Pulpwood volume.--Net volume in standard cords (including bark), of the main stem of pulpwood trees, from the stump to a point where the top breaks up into branches, or to a minimum top diameter of 4.0 inches (inside bark). Deductions are made for all portions of the stem that fail to meet pulpwood bolt requirements.

Pulpwood Stands

Less than 5 cords per acre: Stands with trees 5.0 inches (d.b.h.) and larger that meet pulpwood specifications, and with a net volume per acre of less than 400 cubic feet. (Includes seedling-and-sapling stands and nonstocked areas.)

5 to 15 cords per acre: Stands with trees 5.0 inches (d.b.h.) and larger that meet pulpwood specifications, and with a net volume per acre ranging from 400 to 1,200 cubic feet.

More than 15 cords per acre: Stands with trees 5.0 inches (d.b.h.) and larger that meet pulpwood specifications, and with a net volume per acre of more than 1,200 cubic feet.

FOREST SURVEY METHODS

These forest statistics are based on information gathered from aerial photographs and from sample plots examined on the ground.

First, photo-interpretation plots were marked off on the aerial photographs. These plots were distributed uniformly by mechanical means over photographs of the entire district. Trained photo-interpreters then classified each photo-plot as either forest or nonforest. Forest plots were classified further according to stand-size and forest type.

Field crews inspected some of the photo-plots on the ground. Enough plots were selected at random so as to attain a specified level of statistical accuracy. Species and volume data were collected on these ground plots; and the photo classification of stand size and forest type was verified or--if necessary--changed.

The survey was designed for maximum efficiency in estimating total cubic volume to meet the national standards of accuracy.

ACCURACY OF THE ESTIMATES

The estimates in this report may contain two kinds of error. First, photo-interpreters may make mistakes of judgment and fieldmen may make mistakes in measuring or recording. There is no practical way of finding out just how often such errors occur. But they are kept to a minimum by closely checking all phases of the work.

The second kind of error is associated with sampling procedures. The size of this sampling error can be measured. In the Anthracite Section of Pennsylvania the probabilities are 2 out of 3 that the actual forest area is within ± 1.7 percent of the estimated forest area, that the actual cubic-foot volume is within ± 6.6 percent of the estimated cubic-foot volume, and that the actual board-foot volume is within ± 11.9 percent of the estimated board-foot volume. This does not include any mistakes in measurement or classification.

These percentages show that the area estimates are more accurate than the volume estimates, and that the cubic-

foot estimates are more accurate than the board-foot estimates.

In each of the tables, the total figures are more accurate than the subtotals. The subtotals are more accurate than any of the individual figures. Figures that are small in relation to totals are subject to larger sampling errors.

SPECIES TALLIED

The various commercial tree species tallied in the Anthracite Section of Pennsylvania are listed below. Approved common names¹ are shown in parentheses if they differ from the brief name used in the tables. Other tree species may occur in the area, but unless they were tallied on the field plots they were not included in the following list.

Softwoods

White pine (Eastern white pine)	- <u>Pinus strobus</u>
Hemlock (Eastern hemlock)	- <u>Tsuga canadensis</u>
Other softwoods	
(Red spruce)	- <u>Picea rubens</u>
(Pitch pine)	- <u>Pinus rigida</u>
(Virginia pine)	- <u>Pinus virginiana</u>

Soft Hardwoods

Red maple	- <u>Acer rubrum</u>
Black cherry	- <u>Prunus serotina</u>
Yellow-poplar	- <u>Liriodendron tulipifera</u>
Bigtooth aspen	- <u>Populus grandidentata</u>
Other soft hardwoods	
(Paper birch)	- <u>Betula papyrifera</u>
(American basswood)	- <u>Tilia americana</u>
(Sweetgum)	- <u>Liquidambar styraciflua</u>
(Butternut)	- <u>Juglans cinerea</u>
(Elm)	- <u>Ulmus species</u>

Hard Hardwoods

Red oak (Northern red oak)	- <u>Quercus rubra</u>
(Black oak)	- <u>Quercus velutina</u>
(Scarlet oak)	- <u>Quercus coccinea</u>

¹Little, Elbert L., Jr. Check list of native and naturalized trees of the United States (including Alaska). U.S. Dept. Agr., Agr. Handb. 41. 472 pp. 1953.

Chestnut oak	- <u>Quercus prinus</u>
White oak	- <u>Quercus alba</u>
Sweet birch	- <u>Betula lenta</u>
Yellow birch	- <u>Betula alleghaniensis</u>
Other hard hardwoods	
(Sugar maple)	- <u>Acer saccharum</u>
(American beech)	- <u>Fagus grandifolia</u>
(Ash)	- <u>Fraxinus</u> species
(Hickory)	- <u>Carya</u> species
(Black walnut)	- <u>Juglans nigra</u>
(Flowering dogwood)	- <u>Cornus florida</u>
